CASES OF TRIGEMINAL SPASM: RESECTION—PROBABLE PRESENCE OF SENSORY FIBRES IN THE SEVENTH NERVE.

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It will not be necessary to state elaborately the history of the patients, a portion of whose symptoms furnish the subject of this brief paper. It is the condition of sensation following the operations for relief, which is interesting.

Briefly, both patients were of the laboring class, both Irish-born, both about sixty years of age. The first, a male, H. M., had a typical example of tic douloureux affecting the supra-orbital distribution on the right side. The usual history of persecution by tooth-drawing was given. Medical measures, especially galvanization, relieved him temporarily when he first applied at the Infirmary for Nervous Diseases. The tic returned in a few weeks as severe as ever, and operation was recommended, and portions of the supraorbital and supratrochlear nerves were removed by Dr. W. W. Keen, November 11th, 1897. Some slight difficulty was experienced in recognizing the former nerve, on account of the hæmorrhage, and to make sure the supposed trunk was carefully followed into the orbit and resected somewhat further back than usual. The portion removed was by inadvertence put in alcohol, which rendered it impossible to make any satisfactory study of its condition, but there was no question of its identity. The patient had at once complete relief from pain, except for two or three slight paroxysms during the fortnight after. The dressings were removed on the third day after operation, and a hasty examination of the condition made. Some degree of anæsthesia was present for touch and pain in the area usually supplied by the ophthalmic division of the superior maxillary branch. It was noticed then that the loss of sensation was less complete than might have been expected, and seemed to be absolute only in an oval area at the outer canthus of the eyelids and on the upper lid. Later, on the sixth day, opportunity was had for a more careful study. An oval space of about the area of a silver dollar on the temple, at the outer canthus, remained obtuse to touch, but pressure or decided pain was perceivable in this region. Complete anæsthesia of the upper lid persisted. The patient was examined again before his discharge from the hospital, nearly three weeks after operation, and no material change from the described condition was found, except that the area of anæsthesia was a trifle more sensitive.

The second patient, A. K., a married woman, was admitted from Dr. Weir Mitchell's out-service, suffering with pain and spasm throughout the supraorbital distribution, and to a less degree in the superior maxillary division, especially in the palpebral and nasal branches.

Dr. Keen operated on this patient, March 3d, 1898, resecting about half an inch of the supraorbital nerve, drawing the infraorbital out of its canal, and cutting it off also. The former divided rather further from the surface than usual, and at the notch presented several small trunks. The face swelled on the right side after the operation, but otherwise the patient did well.

The excised portions were teased and placed in osmic acid at once, and the interesting changes found will be commented on later.

On investigating Mrs. K.'s face four days after the operation, which was done minutely, on account of the findings in the previous case, we were astonished to discover an even less degree of loss of touch, pain and heat sense than was present in M.'s examination. Indeed, it could scarcely be said that there was more than slight delay or impairment of perception anywhere in the supraorbital, nasal, palpebral or labial branches. In the line of the incision made to reach the infraorbital foramen there was poor touch perception, but by the ninth day after operation, when Mrs. K. was discharged, there was neither slowness nor impairment of sensation for any form of stimulation. The touch of the finest filament of thread was instantly felt, and correctly located, everywhere on the cheek, temple, nose, eyelids, and upper lip. On April 20th, the examinations were carefully repeated on both patients—five months after M.'s and seven weeks after Mrs. K.'s operation. In the former, an area of about 1½ by 1 inch on the top of the skull, a little anterior to the vertex and slightly to the right of the middle line, was found to be slightly obtuse to pain. The patient voluntarily stated that the upper part of the right face felt slightly numb. No impairment of sensation could be discovered, even in the line of the cicatrix. Of Mrs. K. the same statement could be made; her perception of touch, pain and heat was rapid and perfect. There was absolutely no lessening of sensibility in any form in either person.

Before discussing possible explanations of these curious results, it may be well to say that, as will be seen, there can be no doubt that the nerves were removed, and the perfection of sensation cannot be attributed to incomplete removal or mistake in operation. Perfect relief followed the surgical intervention, and, moreover, the nerve tissues were microscopically identified. But, even if it were possible to question the entire destruction of the involved nerves, it would still be curious that the restoration of sensation should be so complete, and occur so soon. It is impossible to contend that regeneration of the cut nerves had taken place, for not only was the time too short, but the operations consisted not merely in section, but in the removal of considerable lengths of the nerve trunks.

It is certain that in most cases of neurectomy for tic douloureux anæsthesia in the distribution of the resected nerve follows, but the present are not the only instances in which an exception to this rule has been noted by the present writer. In a case[1] reported with Dr. W. W. Keen, in which the Gasserian ganglion was removed as the last of fourteen operations, or attempts at operation, for persistent tic, very curious conditions of sensation were present. Before the final operation sensation in the face seemed in an anomalous state, but, as the patient had had the infraorbital nerve cut or removed at three different times, the third division of the fifth resected, the upper jaw bodily removed, and the inferior dental canal laid open and the nerve removed, the face was a tangle of scars, which complicated the examination of sense perception very greatly. The unfortunate man was suffering three or four paroxysms of pain daily. The whole upper right face was extremely sensitive; to touch the eye, to twitch the eyelid, to open the mouth widely, would bring on a furious attack of pain in the *lower jaw.* He was taking morphia steadily, so that various circumstances united to make it difficult to judge exactly the distribution or alteration of sensation; but, so far as could be told, the only part of the face totally anæsthetic to touch was on the right cheek, extending from near the middle line on the right of the nose down to, and including, the ala nasi and out upon the cheek about one and one-half inches, vaguely covering the territory of the infraorbital nerve.

The rest of the face had diminished sensation to touch, but thermic sensation was perfect. After the removal of the ganglion the patient's mental condition was such for nine or ten weeks that no study of the sensation could be made, but, when it became possible, there was no absolute anæsthesia to be found, except between the margins of the wound. Touch-sense was everywhere preserved in some degree, pain-sense was but slightly less than before the operation. He had no spontaneous pain in any part after the operation.

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[1] Removal of the Gasserian ganglion for tic douloureux: Med. and Surg. Reporter, vol. lxx., No. 12, p. 414.

In the regions supplied by the supraorbital nerve sensibility to touch was diminished as far as the vertex upward, and forward to the median line of the face from the lobe of the ear and the lower border of the inferior maxilla. The mucous membrane of the lips and cheek on the right side, and the right side of the tongue were also partially anæsthetic. On the right side the sense of taste was entirely lost. The ocular and palpebral conjunctivæ were insensible to touch, but in the right infraorbital region immediately about the scar of the operation upon the infraorbital nerve, there was a small area which was hyperæsthetic.

When seen more than two months after the operation, it was found that an area as large as a half-dollar, with its centre upon the outer third of the right eyebrow, covered a space which was hyperæsthetic to touch, though not to pain, and this although he was unable to move voluntarily the muscles above the brow on this side. Had this patient continued to have *pain* after the ganglion operation, it would have been less astonishing than to find sensation to peripheral stimuli remaining. If the ganglion itself be diseased, whether as a cause or as a consequence of the peripheral nerve trouble, the removal of the ganglion will not affect possible degenerative changes reaching beyond it, and affecting the trigeminal sensory tract in the thalamus, or in its cortical terminus. Disturbances really due to these deep brain changes might be referred to the surface still, in a way aptly comparable to the reference of pain to the extremities of amputated limbs. But, for peripheral touch to be correctly perceived and localized after destruction of the ganglion, or after total ablation of the nerves leading to it from the stimulated part, makes some other explanation than this necessary.

Before discussing possible explanations, something must be said as to the nerve supply of the parts involved. The generally accepted cutaneous distribution of the sensory portion of the fifth gives to the supraorbital branch the supply of the forehead, anterior part of the temple and crown of the head, back to the region supplied by the occipital branches of the second cervical. The eyelids, anterior cheek, nose and upper lip are furnished from the second division, the temples and the rest of the face proper, except the under part of the chin and posterior edges of the lower jaw, being supplied by the third division.

It may at once be said that maps of nerve distribution founded largely upon the somewhat coarse methods of the dissection-table are unreliable. Variations are so frequent they can scarcely be called anomalies. Undescribed anastomoses are often found in operating; whole areas are observed to be furnished with sensory supplies in a manner different from the text-book descriptions. The present writer has before commented upon the frequency, one might almost say the regularity, of unusual distribution in the nerves of the hand and forearm, and the surgical and diagnostic difficulties arising therefrom. But, admitting every probability of error due to such differences, no theory founded on this will suffice to account for such preservation of tactile sensibility as was observed in these cases. One anomaly was very likely present in the first case. The area described as anæsthetic upon the first examination, namely, a region of oval shape at the outer canthus, and covering a small part of the malar prominence, the superciliary ridge and the temple, is usually supplied by the lachrymal branch of the ophthalmic division. The lachrymal leaves the main trunk in the cavernous sinus, and should, therefore, not have been reached by the operation, unless by some reflex effect upon its conducting power caused by the "shock" to the ophthalmic trunk. It is curious that the same, or nearly the same, area was found hyperæsthetic in the third patient after the ganglion removal.

It may be suggested that the nerves cross the middle line in their final sensory distribution, and that thus each nerve supplies both sides of the face. This is mere supposition; there is no positive evidence of it. If this were at all a constant fact, then, after resection, some loss of sensation should be occasionally observed in corresponding territory on the opposite side of the face; but neither in the present cases, nor in any others, has this been observed, so far as is known to the writer. If both sides are supplied by each nerve so thoroughly as such perfect sense-perception as these cases have would imply, why should there be any anæsthesia after operation at all? Then, too, in these instances at least, the survival of sensation is too complete. In the first there was no impairment a few days after operation; in the second, very little.

What secondary or subsidiary sensory supply could reach these parts? must, then, be the question. The only nerve, beside the fifth, in any way supplying the surfaces of the anterior portion of the head, other than the parts usually deriving their nerve supplies from the upper cervical nerves, is the facial. The facial has been suspected, so to speak, of containing sensory fibres. It is not necessary to refer to the loss of taste occasionally found in cases of facial paralysis, as tending to show the presence of sensory fibres, because this may be directly accounted for by recalling the close anatomical relations of the facial and the chorda tympani, which might well make them both subject to a concomitant lesion, not to mention the near neighborhood of the nuclei of the glossopharyngeal and the nerve of Wrisberg. There are other evidences than these, both pathologic and clinical. To quote some of them: Turner[2] says: "Certain minor connections are said to exist between the facial nucleus and the corpus trapezoides and the sensory trigeminal root."

Ramon y Cajal[3] believes "that the facial nucleus receives axis cylinders from the cells of the substantia gelatinosa, which substance accompanies the descending spinal root of the fifth, connection thus being made between the fifth and seventh nerves."

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[2] Edinburgh Hosp. Rep., vol. iv., 1896.

[3] Quoted from Mills' "The Nervous System and its Diseases," p. 901.

The facial nucleus, in all probability, will be proved to have connections with the thalamus; at present, although this has not been directly proven anatomically, both clinical and physiological facts point that way. Lesions of the thalamus and of the posterior part of the internal capsule have been found, both by experimental and clinical observation, to result in anæsthesia of one side of the body and face; thus here also the fifth and seventh may possibly be in close relation.

As a small piece of negative evidence, might be added the fact that the course of the central neurons of the upper portion of the seventh has not been definitely traced, and may be said to be as yet unknown. Frankl-Hochwart examined, in Nothnagel's clinic, some twenty cases of paralysis of the facial; in eight of these he found sensory or vasomotor disturbances. Sensation was very little altered in any of them, and the disturbance appears, from the brief reports of his observations, to have consisted merely in the slighter grades of anæsthesia. He believes that even these slight changes give ground for the assumption that sensory fibres exist in the facial nerve in man, as it is well known they do in animals.

The cases here reported strengthen, from clinical observation, the probability of this view. No doubt other observations will be made confirming these. What would be of most importance would be to discover peripheral sensory changes of decided or constant character in cases of facial paralysis. Could a series sufficiently large of cases of total paralysis of the seventh be observed without any of them presenting any sensory changes, such a mass of negative evidence might be held to outweigh the small positive results; but till then the probable explanation of such conditions as these here reported may be held to lie in the presence of sensory fibres in the seventh nerve.

For the sake of the interest, although somewhat beside the chief subject of this paper, Dr. William G. Spiller's comments on the pathological findings in the nerves removed from the second case are added, by his courtesy:

Many, possibly most, of the nerve fibres of the infraorbital nerve, when separated from one another by teasing and stained by a one per cent. solution of osmic acid, are found to contain numerous black balls, approximately of the same size. These are nearly equidistant from one another, and are located along the edges of the fibres, leaving, as a rule, the centres free from such accumulations. When the focus of the lens is changed, so as to bring other portions of the fibres into view, black balls are apparently found within the centres, but these are probably along the superficial and deep portions of the fibres. The medullary sheaths are thus broken into numerous masses of nearly equal size, occupying the normal position of the myelin sheaths. It is exceptional to find masses of degenerated myelin of a size so large as is frequently seen in degenerating fibres. Similar lesions are found in the supraorbital branch of the fifth nerve. Inasmuch as these nerves were taken from the living subject, and placed immediately afterward in osmic acid, these myelin balls cannot be regarded as artifacts due to surgical interference. Such interference causes a breaking of the fibres into irregular masses, but probably not the fragmentation of the myelin into numerous balls.

Sections cut with the microtome and stained with carmine and Delafield's hæmatoxylin show more or less round cell infiltration about the small vessels. The coats of the smallest vessels are not notably thickened, but one vessel of larger size, found in some of the sections, presents a thick media and a somewhat proliferated intima. In some of the nerve fibres pale purple bodies are found, which resemble the amyloid bodies, and lend much support to the view that the latter are degenerated nerve

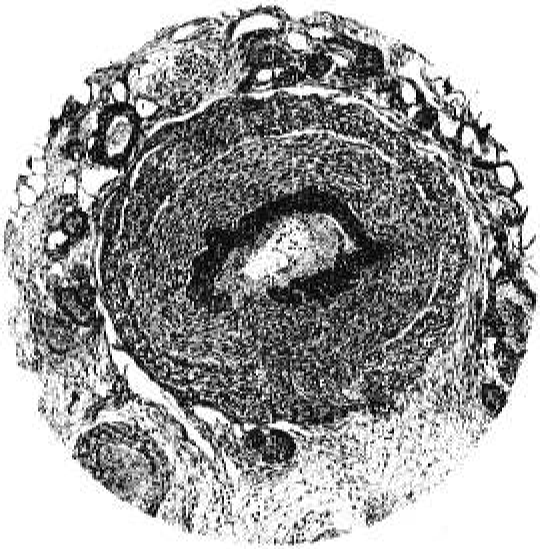

FIG. I.

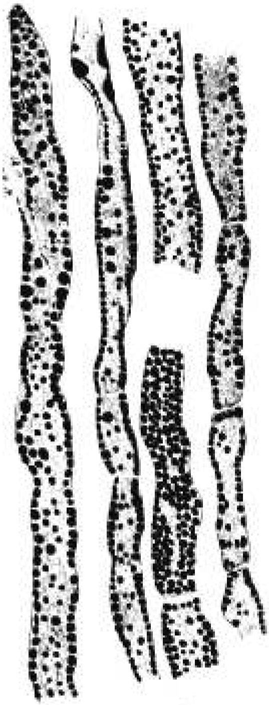

FIG. III.

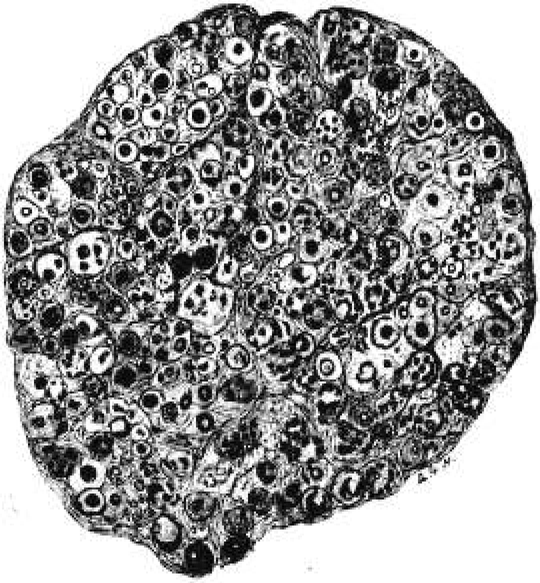

FIG. II.

FIG. I. Thickened vessel from the infraorbital nerve.

FIG. II. Infraorbital nerve stained by the method of Weigert. Balls of myelin are seen as chains of beads about the axis cylinders.

FIG. III. The medullary sheaths are broken into numerous balls.